

Dynamix 1444 Series Monitoring System Specifications

Catalog Numbers 1444-DYN04-01RA, 1444-TSCX02-02RB, 1444-RELX00-04RB, 1444-AOFX00-04RB, 1444-TB-A, 1444-TB-B

The Dynamix™ series of intelligent I/O modules process, in real-time, critical parameters that are used in protecting industrial machinery from imminent failure, and in assessing the machines current and predicted health. The versatile 1444 series can be made an independent solution for serving condition monitoring data. The monitoring data can be sourced from simple motors, pumps, and fans or part of a Turbine Supervisory Instrumentation system. The Turbine Supervisory Instrumentation system serves diagnostic data while protecting high-speed turbo compressors, steam or gas turbines, and other critical rotating or reciprocating machines.



The 1444 series can perform its protection function entirely on its own by using its integral relays and can communicate machine status and condition data, including discrete fault indicating parameters to plant control and information management systems. As part of the Rockwell Automation Integrated Architecture® system, configuration and management of the Dynamix system is accomplished through a Logix controller,⁽¹⁾ which is linked via an EtherNet/IP industrial network.

Tight coupling of the Dynamix system with the Integrated Architecture system permits the application of other Integrated Architecture system components such as controllers, visualization products, other input and output products, and more. This integration provides a seamless, easily-deployed and maintained system that can be tailored to the needs of each application that it serves.

(1) The Dynamix system performs its safety and protection function regardless of the availability of the controller.



The Dynamix series consists of just six core part numbers and various accessories for connectors and cables.

Table 1 - 1444 Series Catalog Numbers

Type	Module	Cat. No.	Page
Measurement modules	Dynamic Measurement Module	1444-DYN04-01RA	5
Speed modules	Tachometer Signal Conditioner Expansion Module	1444-TSCX02-02RB	13
Relay modules	Relay Expansion Module	1444-RELX00-04RB	15
Analog output modules	4...20mA Expansion Module	1444-AOFX00-04RB	16
Terminal bases	Dynamic Measurement Module Terminal Base	1444-TB-A	18
	Expansion Module Terminal Base	1444-TB-B	18

Table 2 - Removable Plug Connector Sets

Module	Spring Connector	Screw Connector	Page
1444-DYN04-01RA	1444-DYN-RPC-SPR-01	1444-DYN-RPC-SCW-01	19
1444-TSCX02-02RB	1444-TSC-RPC-SPR-01	1444-TSC-RPC-SCW-01	19
1444-RELX00-04RB	1444-REL-RPC-SPR-01	1444-REL-RPC-SCW-01	19
1444-AOFX00-04RB	1444-AOF-RPC-SPR-01	1444-AOF-RPC-SCW-01	19
Terminal Base	Spring Connector	Screw Connector	Page
1444-TB-A	1444-TBA-RPC-SPR-01	1444-TBA-RPC-SCW-01	19
1444-TB-B	1444-TBB-RPC-SPR-01	1444-TBB-RPC-SCW-01	19

Table 3 - 1444 Series Interconnect Cable Accessories

Cat. No.	Description	Page
1444-LBIC-04	Local Bus Interconnect Cable (qty 4)	19
1444-LBXC-0M3-01	Local Bus Extender Cable (0.3 m)	19
1444-LBXC-1M0-01	Local Bus Extender Cable (1.0 m)	19

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation® industrial system.
Product Certifications website, http://www.rockwellautomation.com/rockwellautomation/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at <http://www.rockwellautomation.com/literature>. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Dynamix 1444 Series Common

Dynamix 1444 series modules are designed to serve the condition monitoring requirements of rotating and reciprocating industrial machinery. The family includes the 1444-DYN04-01RA high performance, highly-configurable main module. The 1444-TSCX02-02RB modules provide tachometer signal conditioning. The 1444-RELX00-04RB relays, 1444-AOFX00-04RB analog outputs, and 1444-TB-A/B terminal bases are also included in the family. The modules are applied in combinations as necessary to the application.

All 1444 series modules and terminal bases share the following common hardware specifications.

Table 4 - 1444 Series Common Hardware Specifications

Attribute	1444-DYN04-01RA, 1444-TSCX02-02RB, 1444-RELX00-04RB, 1444-AOFX00-04RB, 1444-TB-A/B
Technical Specifications	
Enclosure type rating	None (open-style)
North American Temp Code	T4
IEC Temp Code	T4
Power	
Voltage	Input: 18...32V DC, max 5 A SELV/class 2 source
Conformal Coating	
All printed circuit boards are conformal coated in accordance with IPC-A-610C and in compliance with:	<ul style="list-style-type: none"> IPC-CC-830B UL508
Environmental Specifications	
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock):	-25...70 °C (-13...158 °F)
Temperature, surrounding air, max	70 °C (158 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock):	-40...85 °C (-40...185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat):	5...95% noncondensing
Vibration Per IEC 600068-2-6 (Test Fc, Operating):	2 g @ 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock):	15 g

Table 4 - 1444 Series Common Hardware Specifications

Attribute	1444-DYN04-01RA, 1444-TSCX02-02RB, 1444-RELX00-04RB, 1444-AOFX00-04RB, 1444-TB-A/B
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock):	30 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2:	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-3:	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 900 MHz 1V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
Conducted RF immunity IEC 61000-4-6:	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Certifications⁽¹⁾	
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/EC EMC Directive, compliant with: <ul style="list-style-type: none"> EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: ⁽²⁾ EN 61131-2; Programmable Controllers (Clause 11)
RCM	EN 61000-6-4; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: <ul style="list-style-type: none"> EN 60079-15; Potentially Explosive Atmospheres, Protection "n" EN 60079-0; General Requirements II 3 G Ex nA IIC T4 Gc II 3 G Ex nA nC IIC T4 Gc (only 1444-DYN04-01RA and 1444-RELX00-04RB) DEMKO14ATEX1365X
IECEx	IECEx System, compliant with: <ul style="list-style-type: none"> IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" IEC 60079-0; General Requirements II 3 G Ex nA IIC T4 Gc II 3 G Ex nA nC IIC T4 Gc (only 1444-DYN04-01RA and 1444-RELX00-04RB) IECEx UL 14.0082X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

- (1) When product or packaging is marked. See the Product Certification link at <http://www.rockwellautomation.com/> for Declarations of Conformity.
(2) Applies to only 1444-DYN04-01RA and 1444-RELX00-04RB modules.

API-670 Compliance

The 1444 series is designed in accordance with the relevant sections of the 5th Edition of the American Petroleum

Institutes (API) standard 670,⁽¹⁾ ‘Machinery Protection Systems’.

Local Bus

The 1444 series family includes a power and communication bus that, similarly to the backplane of a rack-based system, connects a series of modules.⁽²⁾ The Local Bus is implemented by using simple ribbon connectors that typically span adjacent modules.⁽³⁾

Table 5 - Local Bus Function

Attribute	Description
Power	Passes power from each main module (1444-DYN04-01RA) to its expansion modules
	Power is not passed between main modules
	When redundant power supplies are connected to a main module, only the voted power source is distributed to its expansion modules.
TTL signals	Dual independent TTL signals, with tachometer sensor status, are passed on the Local Bus
	There can be only one tachometer expansion module on a local bus
	The TTL signal can serve up to 6 main modules
Communication	A digital network that is used between a main module and its expansion modules is implemented on the local bus
	Communication does not link main modules

Insert and Remove Under Power



WARNING: If you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

WARNING: If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

All 1444 series modules can be removed and replaced while power is applied to its terminal base⁽⁴⁾, ⁽⁵⁾.

Mounting and Connections

DIN Rail

Terminal bases require DIN mounting by using 35 x 7.5 mm rail.

1444 series modules do not connect ground to the DIN rail, therefore coated DIN rail is acceptable.

Wiring Connectors

Field wiring landed to 1444 series modules and terminal bases are via 45°, front access, removable plug connectors with screw and spring-cage connectors available⁽⁶⁾.

Each connector is keyed such that it can be inserted into the location on the module or terminal base that it serves. Connectors are secured in place by quarter-turn screws.

(1) Whether a system is compliant is dependent on the components that are provided, the various optional elements of the standard that you require, and the configuration of the installed system.
 (2) Any main module must be installed to the left of any expansion modules that it manages.
 (3) A short ribbon cable, suitable for connecting adjacent modules, is included with each terminal base. See the [Accessories](#) section of this publication for a description of available extended length cables.

(4) If a removed module includes an energized relay, the relay goes to its de-energized state.
 (5) If Ethernet is daisy chained, one module to the next, and DLR is not used, removing a main module causes the loss of Ethernet communication to all ‘downstream’ main modules.
 (6) A spring cage or screw clamp Removable Plug Connector set must be purchased for each module and terminal base ordered. See [Table 2](#) for available catalog numbers.

Table 6 - Field Wiring Termination Requirements

Attribute	Description
Conductor type	Copper
Conductor/insulation temperature rating, min	85 °C (185 °F)
Operating temperature, max (screw type only)	115 °C (239 °F)
Operating temperature, max (spring type only)	105 °C (221 °F)
Torque (screw type only)	0.22... 0.25 N·m (2...2.2 lb-in)
Stripping length	9 mm (0.35 in.)
Conductor cross-section solid or stranded	0.14... 1.5 mm ² (26...16 AWG)
Conductor cross-section stranded with ferrule without plastic sleeve	0.25... 1.5 mm ² (24...16 AWG)
Conductor cross-section stranded with ferrule with plastic sleeve	0.25... 0.5 mm ² (24...20 AWG)
Conductor cross-section AWG/kcmil	0.08... 1.5 mm ² (28...16 AWG)
Conductor UL/cUL AWG (screw type only)	0.05... 1.5 mm ² (30...16 AWG)
Conductor UL/cUL AWG (spring type only)	0.08... 1.5 mm ² (28...16 AWG)

Controller Independence

While the 1444 series is dependent on a Logix controller for its initial configuration, it is not dependent on the controller to perform its protection function. If communication with the controller is lost, the system continues to perform measurements, evaluate alarm conditions and, if necessary, actuate its relays. It also remains available to serve data to other hosts⁽¹⁾ that can remain accessible.

Nonvolatile Memory

After its initial configuration, a 1444 series Main Module maintains its configuration in nonvolatile memory. After

(1) Only the controller that 'owns' a module can change its configuration. Other processors such as personal computers, DCS computers, or other controllers, can query the module for data.

any subsequent power cycle, the module loads its configuration from the nonvolatile memory and resumes its normal function. This process makes sure that even if the controller is not accessible after powerup that the monitor performs its function.

Dynamic Measurement Module (1444-DYN04-01RA)



The Dynamix 1444 Series dynamic measurement module has four channel and is capable of general purpose monitoring. The dynamic measurement module serves industrial machinery protection and condition monitoring applications. The module supports measurements of

dynamic inputs such as vibration and pressure. The module supports measurements of and static inputs such as thrust, eccentricity, and rod drop. The module can be used for monitoring the following:

- Shaft vibration
- Casing vibration
- Pedestal vibration
- Shaft and rod position
- Casing expansion
- Other critical dynamic and position measurements on rotating and reciprocating machinery

To achieve this degree of adaptability, the module couples an extraordinarily flexible firmware and a powerful multi-processor hardware platform.

The 1444-DYN04-01RA module is designed specifically for integration with Allen-Bradley® Logix 5000™ controllers that are connected across an industrial Ethernet network. This design makes the 1444 series unequalled in its ability to serve as a synergetic member of larger total facility control and information management systems.

Hardware Specifications

Table 7 - 1444-DYN04-01RA H/W Specifications

Attribute	Description
Channel Inputs (4)	
Sensor types	ICP accelerometers (CCS) Dynamic pressure transducers Dual sensors (acceleration + temperature) Eddy current probe systems (-24V DC) Self-powered sensors Voltage signals
Transducer positive power	Constant current: 4mA @ 24V Voltage regulated: 24V/25 mA
Transducer negative power	Voltage regulated: -24V/25 mA
Voltage range	± 24V DC
Isolation	Non-isolated, single-ended analog inputs. Sensor signal returns must be isolated from ground
Impedance	>100 kΩ
Protection	Reverse polarity
Transducer fault detection	Bias level high / low limits Current threshold level monitoring, which is implemented in hardware for -24V supplied sensors. Provides the fastest, most reliable fault detection possible
A/D Converter	
Conversion	24 bit
Measurement accuracy	± 0.1% full scale minimum (3 μV theoretical)
Dynamic range	80 dBfs (0.01% fs), 90 dBfs typical
Sample rate	2 Channels 93 kS/s 4 Channels 47 kS/s
Tachometer Inputs (2)	
Terminal inputs	TTL class with internal pull-up resistor (5V DC)
Local bus inputs	Opto-isolated TTL input for signal and TX status
Detection threshold	Fixed (-2.5V DC)
Transducer status	Only local bus inputs
Protection	Reverse polarity
Digital Inputs (2)	
Connection	Terminal pins
Type	TTL class
Power	32V DC, 15 mA max per output
Isolation	Non-isolated
Application	Trip inhibit/bypass Alarm/relay reset Alarm SPM/gate control 0, 1 Tachometer 0, 1 status
Digital Outputs (2)	
Connection	Terminal pins
Type	Opto-isolated open-collector

Table 7 - 1444-DYN04-01RA H/W Specifications

Attribute	Description
Power	32V DC, 15 mA max per output
Application	Module status Tachometer 0, 1 TTL Tachometer 0, 1 status Replicate digital input 0, 1 Transducer 0...3 Status Voted alarm 0...12 status
Buffered Outputs (4)	
Connections	Terminal pins BNC
Protection	Short circuit protected
Power	± 24V, 8 mA max per output
Relay (1)	
Contact arrangement	Single pole double throw (SPDT) Change-over contact
Rating	250V AC/24V DC, 5A max @ 40 °C (104 °F), 2 A @ 70 °C (158 °F)
Indicators	
Status indicators (16)	Power Module status Network status Processor status Processor operating state DSP status DSP operating state Channel status (4) Relay status Ethernet link status (2) Ethernet activity indicator (2)
Real-Time Clock	
Synchronization	IEEE-1588 standard ver. 2 CIP sync (ODVA)
Accuracy	Max drift: 100 ms per year
Communication	
Ethernet	Connector (2): RJ45, shielded Speed: 10 MB/100 MB Modes: half/full duplex Operation: auto-switching - auto negotiation - auto mitigation
Communication protocol	ODVA compliant (conformance tested) EtherNet/IP industrial protocol
Supported connectivity protocols	Single Ethernet (IEEE 802.3) Device level ring (ODVA)
IP address	Set by hardware switch on the terminal base Set in configuration (retained in nonvolatile memory)
Concurrent access	Controller (owner) Up to 3 (more) sessions
Power	
Connections (2)	Terminal pins
Current	411 mA @ 24V (546...319 mA @ 18...32V)
Consumption	11.5 W
Dissipation	9 W

Table 7 - 1444-DYN04-01RA H/W Specifications

Attribute	Description	
Redundant power	Two 18...32V DC, max 5 A SELV/class 2 power supply inputs	
	Higher voltage supply is applied to main and expansion modules	
Power monitor	The two power supply voltage levels are monitored. Status indicated via process operating status indicators and on controller input (I/O).	
Isolation voltage	50V (continuous), basic insulation type between Ethernet, power, ground, and AUX bus 50V (continuous), basic insulation type between signal ports, power, ground, and AUX bus 250V (continuous), basic insulation type between relay ports and system No isolation between signal ports and Ethernet ports No isolation between individual signal ports or Ethernet ports Relay ports type tested at 1500V AC for 60 s All other ports type tested at 707V DC for 60 s	
Environmental		
EFT/B Immunity IEC 61000-4-4:	±2 kV at 5 kHz on unshielded power ports ±2 kV at 5 kHz on shielded signal ports ±2 kV at 5 kHz on shielded Ethernet ports ±3 kV at 5 kHz on unshielded relay ports	
Surge Transient Immunity IEC 61000-4-5:	±1 kV line-line(DM) and ±2 kV line-earth(CM) on unshielded power and relay ports ±2 kV line-earth(CM) on shielded signal ports ±2 kV line-earth(CM) on shielded Ethernet ports	
Terminal Base		
Requires terminal base 1444-TB-A		
Removable Plug Connector Sets		
Module	Spring	1444-DYN-RPC-SPR-01
	Screw	1444-DYN-RPC-SCW-01
Terminal base	Spring	1444-TBA-RPC-SPR-01
	Screw	1444-TBA-RPC-SCW-01
Dimensions		
Definition	H: Height above DIN rail	
	W: Width along DIN rail	
	D: Depth across DIN rail	
Without terminal base (H x W x D)	106 x 102 x 154 mm (4.17 x 4.02 x 6.06 in.)	
With terminal base (H x W x D)	125 x 102 x 158 mm (4.92 x 4.02 x 6.22 in.)	
Weight		
Without terminal base	0.40 kg (0.88 lb)	
With terminal base	0.58 kg (1.28 lb)	
Wiring		
Wiring category ⁽¹⁾	2 - on signal ports 2 - on power ports 2 - on communications ports 1 - on relay ports	
Wire type	Shielded on signal and Ethernet ports Unshielded on power and relay ports	

(1) Use this Conductor Category information for planning conductor routing. See Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Functional Specifications

The capabilities of the 1444-DYN04-01RA module vary depending on configuration.

The selected module Personality defines the application of the channels and the available sample rates per channel, see [Table 8](#).

Table 8 - Module Personalities

Real Time	Description
4 dynamic (5 kHz) or static	Channels sampled in pairs (0/1, 2/3) but configured individually as dynamic (up to 5 kHz Fmax), static, or off
4 dynamic (5 kHz) - dual path	Channels sampled and configured in pairs (0/1, 2/3). Configure pairs as dynamic (up to 5kHz Fmax), static, or off. Dual path internally connects channels 0,2 and 1,3
2 dynamic (20 kHz) + 2 static	Channels sampled and configured in pairs (0/1, 2/3). Configure channels 0/1 as dynamic (up to 20 kHz Fmax) or off, channels 2/3 as static or off
2 dynamic (40 kHz)	Channels 0/1 sampled and configured as a pair. Configure channel pair as dynamic (up to 40 kHz Fmax) or off, or gSE or off. Channels 2/3 are off

The module can measure static values such as position from proportional (DC) voltages, but it is designed to make dynamic measurements. Dynamic measurements are typically of vibration but can also be of pressure, strain, or other signals.

Table 9 - Supported Engineering Units

Signal Type	Engineering Units
Acceleration	m/s ² , inch/s ² , g, mm/s ² , mg, RPM/min
Velocity	m/s, inch/s, mm/s
Displacement	m, mm, micron, inch, mil
Spike energy	gSE
Temperature	°K, °C, °F
Voltage	V, mV
Current	A, mA
Power	W, kW, MW, VA, kVA, VAR, kVAR,
Pressure	Pa, kPa, MPa, bar, mbar, psi
Frequency	Hz, cpm, RPM
Flow	l/min, cgm, US g/min, m3/min
Other	EU

The signal source (input) to dynamic measurements is selectable from up to five points in the signal processing path. Signal sources include the output of the analog to digital converter, before and after the low and high pass filters within the 'primary' signal processing path, and from the output of an entirely independent 'alternate' signal processing path, see [Table 10](#).

Table 10 - Measurement Data Sources

Meas. Source	Description
ADC out	Signal out of the ADC
Pre filter	After Fmax decimation
Mid filter	After low pass filter
Post filter	After high pass filter and integration
Alternate path	Alternate signal path

Signal Conditioning

Table 11 - 1444-DYN04-01RA Signal Conditioning

Attribute	Description
Maximum frequency	4-Ch. protection: 5 kHz 2-Ch. protection: 20 kHz Surveillance: 40 kHz
Low pass filter	-3 dB corner 10 Hz to 5 kHz -24, -60 dB/octave
Signal detection	Peak to peak Peak RMS Calculated peak to peak Calculated peak
Primary Path Signal Conditioning	
Sampling mode	Asynchronous
Bandwidth FMAX *	4 Ch 9 Hz – 18.3 kHz 2 Ch 9 Hz – 36.6 kHz
* See Table 8	
High pass filter	-3 dB corner: 0.1 Hz to 1 kHz -24, -60 dB/octave
Integration	None, single or double
Alternate Path Signal Conditioning	
Sampling mode	Asynchronous Synchronous
Asynchronous mode FMAX*	4 Ch 9 Hz . . . 18.3 kHz 2 Ch 9 Hz . . . 36.6 kHz
* See Table 8 .	
Synchronous mode	Tachometer source: 0, 1 Pulses per rev: 4 . . . 128
Special Dynamic Signal Conditioning	
Absolute shaft	Per channel pair Ch-0/2: displacement Ch-1/3: acceleration or velocity Relative mounting: 0°, 180°

Table 11 - 1444-DYN04-01RA Signal Conditioning

Attribute	Description
gSE	2 gSE channels max Only 2-channel protection or surveillance modes Overall, only TWF/FFT HPF: 200, 500 Hz, 1, 2, 5 kHz FFT FMAX: 100 Hz . . . 5 kHz

Real-Time Measurements

Real-Time measurements are made on the Primary Path signal source data stream. How fast they update is dependent on the selected module personality, see [Table 8](#).

Table 12 - Real-time Measurement Specifications

Personality	Update Rate
Real time	40 ms
Attribute (#)	
Overall (8)	Number per channel: 2 Signal detection Data source: OA 0: post filter (fixed) OA 1: pre/mid filter (selectable) Time constant
Tracking filters (16)	Number per channel: 4 Data source: pre filter Roll Off: -48 dB/octave Per channel Signal detection Integration: none, single, double Revolutions (resolution) Per filter Enable Speed reference: 0 or 1 Order: 0.25 . . . 32x Measure Magnitude Phase (integer orders)
SMAX (2)	Per channel pair
Not 1x (4)	Number per channel: 1
Bias/gap (4)	Number per channel: 1
Shaft absolute (2)	Per channel pair
gSE overall (2)	Number per channel: 1

The module supports common DC and rod drop measurements. When specified, these measurements are also Real-Time measures.

Table 13 - Static (DC) Measurements

Attribute	Description	
Measurement type	DC measurement Rod drop	
DC Measurements		
Measurement types	Proportional voltage	
	Eccentricity	
	Position	Normal (thrust)
		Radial cancel (ramp) differential expansion
Head to head (complimentary) differential expansion		
Rod Drop Measurement		
Trigger source	Speed reference: 0 or 1	

Continuous Measurements

Continuous measurements include the complex time waveforms and FFTs, and the FFT band values. Because time waveforms are captured with ‘maximum overlap’, they can be updated rapidly. However, as these measures are second in priority to any defined real-time measurements, how fast they update is dependent on configuration.

Two complex data measurements can be defined, each with its own data source and TWF/FFT attribute definitions.

One continuous complex data measurement is applied uniquely to the FFT Band measurements. As the band values are the only use of these complex data, the source TWF / FFT are not otherwise available.

Table 14 - Continuous FFT Band Measurements

Personality	Update Rate
Data source	Selectable
Real time	100 ms (typical)
Attribute	Description
FFT (4)	Number of lines: 1,600
	Averaging: exponential
	Number of averages ⁽¹⁾ : 1, 2, 3, 6, 12, 23, 45, 89 or 178
	Windows: none, flat top, hamming, hanning

Table 14 - Continuous FFT Band Measurements

Personality	Update Rate
FFT bands (32)	Number per channel: 8
	Measurement: OA, max peak amp, max peak Hz
	Domain: Hz, orders
	Order domain speed ref: 0, 1

(1) If the Time Waveform data source is Alternate Path, and the Alternate Path processing mode is Synchronous, averaging is performed in the time domain.

The second continuous data measurement is for the time waveform and FFT that are written to the Alarm, Trend (Trend and Alarm Capture), and dynamic measurement buffers. These measurements are also the TWFs and FFTs that are served to a remote host when the ‘current’ complex measurements are requested.

Table 15 - Complex Measurement Specification

Attribute	Description
Data format	32-bit float, 16-bit or 8-bit scaled integer ⁽¹⁾
Time waveform (4)	Number per channel: 1
	Block size: 256...8,192
	Overlap: continuous maximum overlap
	Data source: selectable
	Asynchronous
FFT (4)	Number of lines: 100...1,600
	Averaging: exponential
	Number of averages: 1, 2, 3, 6, 12, 23, 45, 89 or 178
	Windows: none, flat top, hamming, hanning
gSE FFT (2)	Number per channel: 1
	Number of lines: 100...1,600
	Averaging: exponential
	Number of averages: 1, 2, 3, 6, 12, 23, 45, 89 or 178

(1) Smaller data sizes lets memory hold a larger number of measurements, but at reduced precision.

Demand Measurements

Demand measurements are unscheduled data requests from the controller or computers. These data are typically measured from another source, at another resolution, or with another Fmax from the continuous measures.

Because for protection applications the real time and continuous measurements must meet minimum required update rates, Demand data is executed as a background process, as time is available. Therefore how fast Demand

data can be serviced is dependent on module configuration and the modules activity when the request is made.

Table 16 - Demand Measurement Specifications

Personality	Update Rate
Real time	500 ms (typical)
Multiplexed	Configuration dependent

Attribute	Description
Time waveform	Block size: 256 . . . 65,536
	Sample rate: $\leq F_{max}$
	Data source: selectable

FMAX^{SP}: Fmax for the signal path of the selected data source

Speed Measurements

The 1444-DYN04-01RA module includes two speed inputs. The source of the speed measures can be a TTL signal or values that are passed to the module on its Input Table.

The speed values are applied to measurements, not channels. The measurements that are made on signals that are applied to any channel can be processed by using speed values.⁽¹⁾

Table 17 - Speed Measurement Specifications

Attribute (#)	Description
Speed (2)	Number per module: 2
	Source: selectable per speed
	Local bus: TTL Transducer status
	Terminal pins: TTL
	Input table: RPM Transducer status
Speed maximum (2)	1 per speed measurement
	Maximum speed since reset
	Reset via controller I/O

(1) Phase measurements are only valid when the speed used is from a TTL source.

Table 17 - Speed Measurement Specifications

Attribute (#)	Description	
Speed acceleration (2)	1 per speed measurement	
	Units: RPM/min	
	Update rate: 1 / second	
Mode	Normal	2 independent speeds
	Redundant	Speed 0 = Speed 1 when tach 0 in fault

Alarms and Relays

The module offers two types of alarms, measurement and voted alarms. Relays are associated with voted alarms.

Measurement Alarms

Measurement alarms provide for the customary threshold limits that are applied to selected measurements.

Alarm threshold limits can be entered into the configuration, normal mode, or can be read from Controller I/O, profile mode. 'Normal' mode permits the usual static limits. Profile mode lets the controller determine and send to the module the limit for any given machine state, such as an instance of an alarm 'profile' to be applied during a process cycle.

Table 18 - Measurement Alarms

Attribute	Description	
Number	24	
Input parameter	Any real time or discrete continuous measurement	
Alarm form	Over/under threshold	
	Inside/outside window	
Dead band	0 . . . 20% of limit	
Transducer state consideration	OK required	
	Not OK forces alarm	
	OK status not considered	
Processing mode	Normal	Static limits that are applied
	Profile	Limits that are read from controller I/O
Delay times	Separate delay times for alert and danger alarms	
	0.10 . . . 60.0 s	
Sustain time	1.0 s (fixed)	

Table 18 - Measurement Alarms

Attribute	Description	
Set point multiplier Range: 0.1...100x	Multiply the threshold limits by this value when invoked. Can be:	
	Static	Enabled by controller I/O or manual switch
	Adaptive	Up to 5 multipliers that are defined for ranges of any 3rd parameter (typically speed)

Voted Alarms

Voted alarms provide a voted logic solution that is based on the status of up to four measurement alarms.

Table 19 - Voted Alarms

Attribute	Description
Number	13
Input condition	Alert
	Danger
	Transducer fault
Latching	Non-latching, resets when condition clears
	Latching, after condition clears, resets upon command via controller I/O
Fail safe	If assigned to a relay, when in alarm the relay coil is de-energized
Alarm logic	1001, 1002, 2002, 1003, 2003, 3003, 1004, 2004, 3004, 4004, 1002 AND 1002. 2002 OR 2002, 1002 AND 2002, 2002 AND 1002
Logic inputs	1...4 measurement alarms
SPM timer	Number of seconds the SPM is applied after SPM signal is reset.
	From 0...65.5 s in 0.1 s increments
SPM control source	Controller I/O SPM control bit 0 or 1/digital input 0 or 1
Speed gating control	Speed reference: 0, 1
	Condition (>, <, <>, ><)
	Speed limits (low, high)
I/O gating control	Controller output (I/O)
	Select one of 2 control bits

Relays

Relays are enabled and mapped to a voted alarm and selected faults. All logic that is associated with relay actuation on alarm is included in the Voted Alarm

definition.⁽¹⁾ Logic that is associated with relay activation on fault is local to the relay.

Table 20 - Relay Logic Attributes

Attribute	Description
Number	13
Enable	Enable to assign the relay to a voted alarm
Voted alarm	Assign to any enabled voted alarm (0...12)
Faults	Main module fault Main module tachometer fault Expansion module fault Ethernet network fault Expansion bus fault
	If associated to a voted alarm that is configured fail safe, main module fault is required
	Latching/non-latching

Event Management

The 1444 series manages events as follows:

- Optimizes behavior
- Uses alarm gating or adaptive limit multipliers
- Provides tools for recording the occurrence of events and data from an event

Event Log

The module includes a rolling (first-in, first out) event log, held in nonvolatile memory, that is in compliance with API-670.

Table 21 - Event Log Attributes

Attribute	Description
Event types	<ul style="list-style-type: none"> • System • Alarm • Buffer
Conditions	<ul style="list-style-type: none"> • 35 logged conditions • Categorized by event type
Number of entries	<ul style="list-style-type: none"> • 768 total records • 256 records per event type
Time stamp resolution	0.1 ms

(1) Expansion module relays can also be configured to act on fault (page 19).

Trend and Alarm Capture

Comprised of static and dynamic data, the Trend facility provides a source for real time/recent history/high density data without the need for continuous updates to an external data historian.

The Alarm facility provides for the capture of data immediately before and after an alarm or receipt of a trigger from the Controller signals an event. The Alarm facility includes a copy of the Trend buffers static and dynamic data. The static and dynamic data includes some samples after the trigger, plus a second set of static data that was captured at the maximum rate.

Table 22 - Trend and Alarm Capture Attributes

Attribute	Description	
Enable	Enable static data capture	
	Enable dynamic data capture	
Record content	Discrete data	Any number of measurements
	Dynamic data	TWF and FFT per channel
Trend Buffer		
Static data	Number of records: 640	
	Sample rate: N x 100 ms	
Dynamic data	Number of records: 64	
	Sample rate ⁽¹⁾ : N x 100 ms	
Alarm Buffer		
Trigger source	Controller output (I/O) control bit Any voted alarm (alert condition) Any voted alarm (danger) Any voted alarm (TX Fault)	
Saved trend buffer	640 static records	Includes N% records sampled post trigger
	64 dynamic records	Includes N% records sampled post trigger
High-resolution samples	320 static records	
	Sampled rate: 100 ms	

(1) How fast dynamic data can be written to Trend and Alarm buffers is dependent on the total module configuration. While a 1 second rate can be assured, a 100 millisecond rate cannot be possible.

Time Synchronization

Time synchronization on EtherNet/IP is implemented by using CIP Sync. CIP Sync is a technology that is based on and fully compliant with the IEEE-1588 Standard Version 2 for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems. With the

CIP Sync technology, synchronization between 1444 series Modules and networked Controllers down to 100 nanoseconds can be achieved.

Supported Network Topologies

The 1444 series offers two alternatives to the network solution applied. These alternatives include the common single wire Ethernet networks and Device Level Ring networks for when a more fault-tolerant topology is required.

Single Ethernet

By using single Ethernet, as defined by IEEE 802.3, modules are connected in series on a common network. In this architecture, typically, the network is routed through adjacent modules by using one RJ-45 connector as its input and the second connector as an output.

Device Level Ring

Device Level Ring (DLR) is a network topology that lets devices be connected in series, one-to-the-next, and back to the beginning, which forms a ring. Ring topologies offer a far simpler fault-tolerant network design that requires less cabling and can be installed at lower cost, while still providing a resilient, responsive solution.

Unlike typical ring solutions, DLR is deployed at the end devices, instead of the switches. So a DLR enabled device can connect directly to neighboring nodes. A ring topology at the device level greatly reduces the number of wires on the network, and the number of needed industrial Ethernet switches.

Fault Management

On detection of a fault, a Dynamix 1444-DYN04-01RA module provides indication via its status indicators, and communicates the status via Controller I/O. Additionally, the single onboard relay can be configured to actuate based on any of the detected faults, see [Table 23](#).

Table 23 - Main Module Fault Management Specification

Attribute	Description	
Expansion bus link time out	100 ms (fixed)	
Fault actions		
Indication	Flash status indicator (Table 7)	
Controller I/O	Status bits on controller input table	
Relay action	Select fault on any of ⁽¹⁾	Module*
		Expansion module
		Ethernet
		Expansion bus
	Latching/non-latching on fault	
	*Actuates on module fault if associated voted alarm configured fail safe	

(1) If no fault action is defined for the relay of the main module, and the voted alarm that is associated with the relay is not configured Fail Safe, the relay is held in its current position until the fault condition clears.

Controller I/O

The Dynamix 1444-DYN04-01RA module provides the following data in its controller input and output assemblies.

Input

The content of the input assembly is configurable, in Module Definition. At a minimum, the assembly consists of a fixed record of status information.

Additionally the Input Assembly can contain any number of measured values. These values include the real-time measurements that are listed in Table 12, the DC measurements in Table 13, and the continuous measurements that are listed in Table 14.

Table 24 - Controller Input Status Information

Control Bits	
Aux processor	DSP processor
Trend alarm	Transducer
Alarm status	Channel setup
Relay status	Expansion module

Output

The content of the Output assembly is configurable, in Module Definition. The assembly includes various control bits, plus, when specified, speed values and alarm limits.

Table 25 - Controller Output

Control Bits	
Trip inhibit	Alarm buffer trigger
Set point multiplier enable	Alarm buffer reset
Alarm reset	Alarm gate control
Data	
Speed (2)	Alarm limits (16)

Tachometer Signal Conditioner Expansion Module 1444-TSCX042-02RB



The Dynamix 1444 series tachometer signal conditioner expansion module is a two-channel monitor that converts the signal from common speed sensing transducers into a once-per-rev TTL class signal suitable for use by 1444-DYN04-01RA dynamic measurement modules.

The 1444-TSCX02-02RB module is designed for use with a Dynamic Measurement module, which acts as its host, serving power and managing the configuration of the modules.

Table 26 - 1444-TSCX02-02RB Hardware Specifications

Attribute	Description
Channel Inputs (2)	
Sensor types	Voltage signals Eddy current probe systems TTL NPN proximity switch PNP proximity switch Self-generating magnetic sensors
Transducer positive power	Voltage regulated: 24V/25 mA
Transducer negative power	Voltage regulated: -24V/25 mA
Voltage range	± 24V
Isolation	Non-isolated, single-ended analog inputs. Connected sensors shall have their signal return isolated from ground

Table 26 - 1444-TSCX02-02RB Hardware Specifications

Attribute	Description
Impedance	>100 kΩ
Protection	Reverse polarity
A/D converter	24 bit
Measurement accuracy	± 3 degrees of speed input for 1/rev up to 20 kHz
Measurement error	0.0167...4 Hz: ± 0.0033 Hz 4...200 Hz: ± 0.033 Hz 200...340 Hz: ± 0.083 Hz 340...2000 Hz: ± 0.333 Hz 2000...6000 Hz: ± 1.0 Hz 6000...20,000 Hz: ± 2.67 Hz
	1...240 RPM: ± 0.2 RPM 240...12k RPM: ± 2.0 RPM 12k...20.4k RPM: ± 5.0 RPM 20.4k...120k RPM: ± 20 RPM 120k...360k RPM: ± 60 RPM 360k...1,200k RPM: ± 160 RPM
Raw Buffered Outputs (2)	
Connections	BNC
Protection	Short circuit protected
Voltage	± 20V
Conditioned Buffered Outputs (4)	
Connections	Terminal pins
Signal, 1/rev	TTL (2)
Signal, N/rev	TTL (2)
Power	5V DC, 35 mA max per output
Local Bus Outputs (2)	
Connection	Integral, via ribbon connector
Type	Opto-isolated open-collector
Signal	TTL speed (once-per-rev) Tach channel status
Capacity	Can serve 6 main modules (1444-DYN04-01RA) (minimum)
Power	5V DC, 5 mA max per output
Indicators	
Status indicators (4)	Power Channel status (2) Local bus status
Power	
Current	128 mA @ 24V (174...104 mA @ 18...32V)
Consumption	4 W
Dissipation	3 W
Isolation	50V (continuous), basic insulation type between signal ports and AUX bus. No isolation between individual signal ports. Type Tested at 707V DC for 60 s.
Environmental	
EFT/B immunity IEC 61000-4-4:	±2 kV at 5 kHz on shielded signal ports
Surge transient immunity IEC 61000-4-5:	±2 kV line-earth(CM) on shielded signal ports

Table 26 - 1444-TSCX02-02RB Hardware Specifications

Attribute	Description	
Terminal Base		
Requires terminal base 1444-TB-B		
Removable Plug Connector Sets		
Module	Spring	1444-TSC-RPC-SPR-01
	Screw	1444-TSC-RPC-SCW-01
Terminal base	Spring	1444-TBB-RPC-SPR-01
	Screw	1444-TBB-RPC-SCW-01
Dimensions		
Definition	H: height above DIN rail	
	W: width along DIN rail	
	D: depth across DIN rail	
Without terminal base (H x W x D)	65 x 54 x 154 mm (2.56 x 2.13 x 6.06 in.)	
With terminal base (H x W x D)	96 x 54 x 158 mm (3.78 x 2.13 x 6.22 in.)	
Weight		
Without terminal base	0.16 kg (0.35 lb)	
With terminal base	0.26 kg (0.57 lb)	
Wiring		
Wiring category ^{(1),(2)}	2 - on all ports	
Wire type	Shielded on signal ports	

- (1) Use this Conductor Category information for planning conductor routing. See Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).
- (2) Use this Conductor Category information for planning conductor routing as described in the appropriate System Level Installation Manual.

Functional Specifications

Host Module Dependence

The Tachometer Signal Conditioner commonly serves speed signals to main modules other than its host. So, unlike other expansion modules, and except for configuration services, the 1444-TSCX02-02RB operates independently of its host module. Therefore, once configured, the Tachometer Signal Conditioner continuously serves TTL speed signals regardless of the state or availability of its host module or Local Bus.

Fault Management

On failure of self-test or on communication link failure, the Tachometer Signal Conditioner module notifies its host

module, if possible, and signals the condition via status indicators.

Table 27 - TSC Module Functional Specification

Attribute	Description
Communication link time out	1 second (fixed)
Fault Actions	
Module or link	Flash module status indicator

Relay Expansion Module 1444-RELX00-04RB



The Dynamix 1444 series relay expansion module is a four-relay module that serves to add relays to its host module.

The 1444-RELX00-04RB Relay Expansion Module is designed for use with a Dynamic Measurement module that acts as its host, serving power and managing the modules configuration.

Table 28 - 1444-RELX00-04RB Hardware Specifications

Attribute	Description
Relay (4)	
Contact arrangement	Single pole double throw (SPDT) change-over contact
Rating	250V AC/24V DC, 5 A max @ 40 °C (104 °F), 2 A @ 70 °C (158 °F)
Indicators	
Status indicators (6)	Power Relay status (4) Local bus status
Power	
Current	56 mA @ 24V (73...48 mA @ 18...32V)
Consumption	1.6 W
Dissipation	2.3 W
Isolation voltage	250V (continuous), basic insulation type between relay ports and system Type tested at 1500V AC for 60 s
Environmental	
EFT/B immunity IEC 61000-4-4:	±3 kV at 5 kHz on unshielded relay ports

Table 28 - 1444-RELX00-04RB Hardware Specifications

Attribute	Description	
Surge transient immunity IEC 61000-4-5:	±1 kV line-line(DM) and ±2 kV line-earth(CM) on unshielded relay ports	
Terminal Base		
Requires terminal base 1444-TB-B		
Removable Plug Connector Sets		
Module	Spring	1444-REL-RPC-SPR-01
	Screw	1444-REL-RPC-SCW-01
Terminal base	Spring	1444-TBB-RPC-SPR-01
	Screw	1444-TBB-RPC-SCW-01
Dimensions		
Definition	H: height above DIN rail	
	W: width along DIN rail	
	D: depth across DIN rail	
Without terminal base (H x W x D)	65 x 54 x 154 mm (2.56 x 2.13 x 6.06 in.)	
With terminal base (H x W x D)	96 x 54 x 158 mm (3.78 x 2.13 x 6.22 in.)	
Weight		
Without terminal base	0.18 kg (0.40 lb)	
With terminal base	0.28 kg (0.62 lb)	
Wiring		
Wiring category ^{(1),(2)}	1 - on relay ports	
Wire type	Unshielded on relay ports	

- (1) Use this Conductor Category information for planning conductor routing. See Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).
- (2) Use this Conductor Category information for planning conductor routing as described in the appropriate System Level Installation Manual.

Functional Specifications

Host Module Dependence

The Relay Expansion module is designed to act as an extension of its host module. The operation of the 1444-RELX00-04RB module is dependent on the availability of its host.

A handshake communiqué between the relay expansion module and its host are executed continuously to verify communication and each modules operation. Failure of the heartbeat constitutes a Link Failure condition on the relay module and a Module Fault on the main module.

Double-Pole Relays

When API-670 compliance or other applications require use of double-pole, double-throw (DPDT) relays, two expansion module relays can be paired.

Fault Management

If a Relay Expansion module fails self-tests (module fault) or detects a Link Failure, it actuates any relays that are configured as 'Fail Safe' in the referenced Voted Alarm definition and any relays that are configured to actuate on Expansion Bus fault.

Table 29 - Main Module Fault Management Specifications

Attribute	Description
Communication link time out	100 ms (fixed)
Fault Actions	
Indication	Flash status indicator (Table 27)
Host notification	Local bus status indication
Relay action	Select fault on any of ⁽¹⁾ :
	Module*
	Expansion bus
	Latching/non-latching
	* Actuates on module fault if associated voted alarm configured fail safe

(1) If no fault action is defined for the relay, and the voted alarm that is associated with the relay is not configured Fail Safe, the relay is held in its current position until the fault condition clears and the main module commands it otherwise.

Upon re-establishing communication to a relay module, a host module verifies the position of all relays, and commands each to be repositioned based on current alarm status and latching definition.

Analog Output Expansion Module 1444-AOFX00-04RB



The Dynamix 1444 series Analog Output Expansion Module is a four-channel module that outputs 4...20mA analog signals that are proportional to measured values passed to it by the modules host module.

The 1444-AOFX00-04RB Analog Output Expansion module is designed for use with a Dynamic Measurement module, which acts as its host, serving power and managing the modules configuration.

Hardware Specifications

Table 30 - 1444-AOFX00-04RB Hardware Specifications

Attribute	Description	
Channels (4)		
Current output	20 mA max per output	
Protection	Insensitive to polarity	
Accuracy	± 0.1% full scale	
Not OK output	Configurable: force low (2.9 mA), force high (>20 mA), hold current level	
Indicators		
Status indicators (6)	Power Channel status (4) Local bus status	
Power		
Current	18 mA @ 24V (22...8 mA @ 18...32V)	
Consumption	0.76 W	
Dissipation	3.6 W	
Isolation voltage	50V (continuous), basic insulation type between signal ports and AUX bus. No isolation between individual signal ports. Type tested at 707V DC for 60 s	
Environmental		
EFT/B immunity IEC 61000-4-4:	±2 kV at 5 kHz on shielded signal ports	
Surge transient immunity IEC 61000-4-5:	±2 kV line-earth(CM) on shielded signal ports	
Terminal Base		
Requires terminal base 1444-TB-B		
Removable Plug Connector Sets		
Module	Spring	1444-AOF-RPC-SPR-01
	Screw	1444-AOF-RPC-SCW-01

Table 30 - 1444-AOFX00-04RB Hardware Specifications

Attribute	Description	
Terminal base	Spring	1444-TBB-RPC-SPR-01
	Screw	1444-TBB-RPC-SCW-01
Dimensions		
Definition	H: height above DIN rail	
	W: width along DIN rail	
	D: depth across DIN rail	
Without terminal base (H x W x D)	65 x 54 x 154 mm (2.56 x 2.13 x 6.06 in.)	
With terminal base (H x W x D)	96 x 54 x 158 mm (3.78 x 2.13 x 6.22 in.)	
Weight		
Without terminal base	0.14 kg (0.31 lb)	
With terminal base	0.24 kg (0.53 lb)	
Wiring		
Wiring category ^{(1),(2)}	2 - on signal ports	
Wire type	Shielded on all signal ports	

- (1) Use this Conductor Category information for planning conductor routing. See Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).
- (2) Use this Conductor Category information for planning conductor routing as described in the appropriate System Level Installation Manual

Functional Specification

The Analog Output Expansion module is designed to act as an extension of its host module. So the operation of the 1444-AOFX00-04RB module is dependent on the availability of its host.

Fault Management

On failure of self-test or on communication link failure, if possible, the 4...20 mA Output module notifies its host module, signals the condition via status indicators and drives its outputs as specified by configuration, see [Table 31](#).

Table 31 - Analog Output Module Functional Specification

Attribute	Description
Communication time out	1 second (fixed)
Fault Actions	
Indication	Flash module status indicator
Output behavior on fault options	Hold current value
	Force low (<4 mA)
	Force high (>20 mA)

Terminal Bases

Each Dynamix module is installed in a terminal base that, when linked together, serve as the backplane of a 1444 series system.

Besides providing connections for common or ‘dirty’ wiring, the terminal bases provide two key capabilities for the system.

Addressing

The terminal base of the main module, the 1444-TB-A, includes a switch that is used to set the last octet of the IP address for the installed module. The address can be changed in firmware and held in nonvolatile memory. The terminal base switch provides a portable, physical relationship that makes sure that modules installed are at the address set on the base rather than whatever can be in the memory of the module.

The expansion modules terminal base, the 1444-TB-B, also includes an address switch. However, in this case the switch is only used when a relay module is installed. In that case, the relay module must be set as 0, 1, or 2. Addressing for the Tachometer Signal Conditioner expansion module and the Analog Output expansion module is automatic so does not use the switch.

Local Bus

Each terminal base includes the circuitry and connectors necessary to extend the local bus. A ribbon cable is included that is of a length suitable for connecting two adjacent terminal bases.⁽¹⁾

The local bus is not interrupted when a module is removed. Removal or failure of any module does not affect tachometer signals, power, and local bus communication.

- (1) Longer cables are available for use when jumping modules on adjacent DIN rails or when locating modules in other areas of a cabinet.

Terminal Base 1444-TB-A

Table 32 - 1444-TB-A Specifications

Attribute	Description
Module	1444-DYN04-01RA
DIN rail	35 x 7.5 mm according to EN 50022, BS 5584 or DIN 46277-6
Voltage range, input	18...32V DC, max 5 A SELV/class 2 source
Voltage range, auxiliary bus	18...32V, 1 A max
Physical	
Dimensions include module	
Dimensions (H x W x D)	116 x 103.5 x 155.5 mm (4.57 x 4.07 x 6.12 in.)
Weight	204.12 g (0.45 lb)
Removable Plug Connector Sets	
Spring clamp	1444-TBA-RPC-SPR-01
Screw clamp	1444-TBA-RPC-SCW-01

Terminal Base 1444-TB-B

All 1444 series expansion modules work with the same terminal base, 1444-TB-B.

Table 33 - 1444-TB-B Specifications

Attribute	Description
Modules	1444-TSCX02-02RB
	1444-RELX00-04RB
	1444-AOFX00-04RB
DIN rail	35 mm x 7.5 mm according to EN 50022, BS 5584 or DIN 46277-6
Voltage range, input	18...32V DC, max 5 A SELV/class 2 source
Voltage range, auxiliary bus	18...32V, 1 A max
Physical	
Dimensions include module	
Dimensions (H x W x D)	90.2 x 54.7 x 155.5 mm (3.55 x 2.15 x 6.12 in.)
Weight	113.40 g (0.25 lb)
Removable Plug Connector Sets	
Spring clamp	1444-TBB-RPC-SPR-01
Screw clamp	1444-TBB-RPC-SCW-01

Software

Product-specific software, software that is designed specifically for the 1444, and generic software that is not unique to the 1444 series support the Dynamix 1444 series.

Product-specific software, such as the Configuration Add-on Profile (AOP) with the Studio 5000® environment, directly access, and in some cases manage, the data within 1444 series modules.

Generic software is not aware of the details of any product that it is accessing. Generic software access 1444 series data via an OPC connection, or indirectly through the controller.

Configuration Software

The Rockwell Automation Logix controllers serve the configuration of 1444 series modules. After a powerup, or whenever a configuration is changed, the controller automatically pushes the configuration to the module.

The Add-on Profile is a program that executes within the Studio 5000 Engineering & Design Environment™. As part of Rockwell Automation Integrated Architecture, and by using a Studio 5000 Add-on Profile, the 1444 series configuration tools and processes are consistent with all other products that live within the Studio 5000 environment. This consistency makes sure that you spend less time learning the tools and more time defining their implementation.

There is no minimum software version or firmware revision for Major Version 20...23. The minimum firmware revision for Major Version 24 is 24.011.

Table 34 - Controller Memory Requirements

Module Number	kB (apx)
1	50
2...N	15 ea

Condition Monitoring Software

Rockwell Automation Emonitor software cannot directly access data from a 1444 series system. However, Emonitor can access Dynamix System data, including time waveforms

and FFTs, when the Logix controller of the systems hosts the data.

Accessories

Available accessories include terminal plug connectors, extended interconnect cables, and a wide selection of industrial Ethernet cable solutions.

Ethernet Cable

The 1444 series are designed to operate in harsh industrial environments and possibly near electrically noisy or high-voltage devices and wiring.

To assure dependable communication and a proper installation, only shielded, category Cat 5e (or 6), class D (or E) cables must be used.

Ethernet cable accessories are provided by Allen-Bradley 1585 Series Ethernet Media products.

Consult publications 1585-br001 and m117-ca506 for further guidance in selecting cable solutions.^{(1),(2)}

Removable Plug Connectors

1444 series modules are fitted with plug style connectors. The connectors let users wire the connections before installing the terminal base or module. The connectors also let you select between screw clamp and spring cage style terminal connector solutions as necessary for each application. As the modules and terminal bases are not shipped with included plug connectors, you must purchase the necessary connectors as listed in [Table 35](#) and [Table 36](#).

See [Table 35](#) for Spring Style connectors or [Table 36](#) for Screw Style connectors.

- (1) Only Straight connectors are recommended for use with 1444 series modules.
- (2) Be sure that the temperature rating of a selected cable is applicable to the environments that the 1444 series can be installed in, up to 70 °C (158 °F).

Table 35 - Spring Style Removable Plug Connectors

Spring Connectors	
Module	Cat. No.
1444-DYN04-01RA	1444-DYN-RPC-SPR-01
1444-TSCX02-02RB	1444-TSC-RPC-SPR-01
1444-RELX00-04RB	1444-REL-RPC-SPR-01
1444-AOFX00-04RB	1444-AOF-RPC-SPR-01
Terminal Base	Cat. No.
1444-TB-A	1444-TBA-RPC-SPR-01
1444-TB-B	1444-TBB-RPC-SPR-01

Table 36 - Screw Style Removable Plug Connectors

Screw Connectors	
Module	Cat. No.
1444-DYN04-01RA	1444-DYN-RPC-SCW-01
1444-TSCX02-02RB	1444-TSC-RPC-SCW-01
1444-RELX00-04RB	1444-REL-RPC-SCW-01
1444-AOFX00-04RB	1444-AOF-RPC-SCW-01
Terminal Base	Cat. No.
1444-TB-A	1444-TBA-RPC-SCW-01
1444-TB-B	1444-TBB-RPC-SCW-01

Interconnect Cables

1444 series modules are connected via a Local Bus that is implemented by using a simple ribbon cable that spans one module to the next. The packaging for each terminal base includes a cable that is designed to the exact length necessary to connect two adjacent modules.

The Extended Interconnect Cables provide a means to extend the Local Bus between terminal bases on different DIN rails, or in different areas of a cabinet.

Extended Interconnect Cables are rated to 300V and from -40...105 °C (-40...221 °F).

The accessory list, see [Table 37](#), also includes a package of four standard length interconnect cables (PN 1444-LBIC-04). These cables can be used to replace the cable that is included with each terminal base.

Table 37 - Interconnect Cable Accessories

Cat. No.	Description
1444-LBIC-04	Local Bus Interconnect Cable (qty 4)
1444-LBXC-0M3-01	Local Bus Extender Cable (0.3 m)
1444-LBXC-1M0-01	Local Bus Extender Cable (1 m)

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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